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MANELLI DENISON & SELTER
2000 M STREET NW SUITE 700
WASHINGTON, DC 20036-3307

EXAMINER	
CHEN, WENPENG	
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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/220,970
Filing Date: December 23, 1998
Appellant(s): MILLS, RANDELL L.

Jeffrey S. Meicher
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 9/21/2007 appealing from the Office action mailed 12/21/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

The decision of the Board of Patent Appeals and Interference to remand Appeal No. 2004-0883, Application No. 09/220,970 (the present application) for consideration.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

No evidence is relied upon by the examiner in the rejection of the claims under appeal.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 101

(non-statutory)

1. Claims 313-314, 316-322 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The claimed invention is a computer related invention. The Computer-Implemented Invention Guidelines issued by the U.S. Patent and Trademark Office describe the procedures for examining such inventions. A flow chart of the procedures was attached at the end of paper #17.

For Claims 307-322, we examined them according to box 6 in the flow chart. The step in box 6 is to determine whether the invention as defined by the claims falls within one of the three following categories of unpatentable subject matter: (1) Functional descriptive material such as a

data structure per se or a computer program per se, (2) Non-functional descriptive material such as music, literary works or pure data, embodied on a computer readable medium; or (3) A natural phenomenon such as energy or magnetism. *The invention as defined by Claims 307-322 is a data structure stored in a memory. However, the data are not functional and therefore are non-statutory as explained below.*

With regard to Claim 313

Although Claim 313 recites a data structure in a memory, the recited features in the claim body do not constitute a functional description material. Claim 313 recites a plurality of transduced data objects. The data objects are just a compilation of various measured data. As shown in Fig. 3 and pages 8-11, the plurality of transduced data objects can be just output from pixels of a CCD camera. In page 9, lines 8-9, the Applicant explicitly stated that "since the structure of a Fourier series is known in the art, only the parameters need to be stored in a digital embodiment." For a CCD camera, the camera (a transducer) transduces an incoming light into electrical signals by each pixel of the CCD. The location of the pixel in the CCD camera and the electrical signals associated with each pixel are the parameters. The clause in lines 8-11 starting with the word "wherein" is just an intended use and does not provide any functional limitation to the transduced data objects. Any picture data taken by a camera and stored in a memory meet the recited requirement, because they can be used for various images processing including the intended use of association with spectral analysis. The picture data stored in a memory are just data per se such as music or text document. They are just non-functional information provided for a functional machine or processor. The functionality is provided by the machine or processor, not by the compilation of data which is termed data structure here.

Claim Rejections - 35 USC § 112

2. Claims 51-322 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

a. The whole specification describes only an explicit embodiment. The explicit embodiment is supported by the equations shown in the specification. The specification also includes various alternative embodiments to the explicit one. However, because of the untraditional definitions of the steps the alternative embodiments do not provide adequate descriptions to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use all the alternative non-explicit embodiments. For example, the passage in lines 18-25 of page 11 states that "the characteristic modulation is encoded as a delay in time by storing the Fourier series in a specific portion of the Input layer section of the memory wherein the specific portion has n+1 sub time intervals." Not adequate description is given in this paragraph what specific function is used how the encoding is performed.

b. The explicit embodiment of the application is disclosed in Figs. 1-2 and all the equations. It comprises an input layer, an association layer, a string ordering layer, a predominant configuration layer, and a memory. All Claims 51-322 are supported by these five elements.

When one cannot implement any of the above elements, one cannot implement any of Claims 51-322.

The Examiner spent many hours trying to figure out how to implement all of the five elements. Unfortunately, the Examiner cannot follow the specification to do so. The Examiner thus concludes that the specification cannot enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention defined by Claims 51-322. Detailed questions are given below. As long as the Applicant can answer the Examiner's questions and demonstrate the enabling of each questioned step, the Examiner will withdraw the rejection.

In the amendment allowed by the Board to be entered, the Applicant explicitly defined "Fourier series in Fourier space" as follows.

"Fourier series in Fourier space is a sum of trigonometric functions in frequency space where each variable is frequency and the parameters of the Fourier series are input data or processed input data."

According to Eq. (37.32), a Fourier Component (FC) is defined as a function in k space, such as $V(k_\rho, k_z)$ that is a function of (k_ρ, k_z). The function is defined with a set of parameters of an element. In Eq. (37.32), the parameters and the explicit forms of trigonometric functions on the right hand side disappear after summation to create $V(k_\rho, k_z)$ on the left hand side. Accordingly, $V(k_\rho, k_z)$ is indexed with the element's index m, but not explicitly carry any information of the parameters.

According to Eq. (37.33), a Fourier series is a "SFCs" (series of Fourier Components) is also defined as a function in k space, such as $V_{\sum m}(k_\rho, k_z)$ that is also a function of (k_ρ, k_z). After

summation of FCs to form $V_{\sum m}(k_\rho, k_z)$, it does not explicitly carry even the index information of each element m. As a consequence, no mathematical operation can be applied to each individual FC after a Fourier series (FS) is formed. For example, modulation or sampling to a FS can only be specified by (k_ρ, k_z), but not m. According to Eq. (37.107), a sum of FSs of various transducers can be formed and is also defined as a function in k space, such as $V_{\sum s,m}(k_\rho, k_z)$ that is also a function of (k_ρ, k_z). After summation of FSs to form $V_{\sum s,m}(k_\rho, k_z)$, $V_{\sum s,m}(k_\rho, k_z)$ does not explicitly carry the index information of each FS, s, nor element m. As a consequence, no mathematical operation can be applied to each individual FC or each individual FS after a string is formed. For example, modulation or sampling to a string can only be specified by (k_ρ, k_z), but not s or m.

Question (1)

In Fig. 21A, a sum of FSs is formed and stored in a register according the second equation in Fig. 21A. One ordinary person skill in the art knows how to do it based on this equation. However, one ordinary person skill in the art does not know how to recall Fourier series based the third equation of Fig. 21A. As explained above, after the sum of FSs is formed according the second equation of Fig. 21A, the only information remained is the left hand side of the second equation $V_{\sum s,m}(k_\rho, k_z)$. It is only an equation of (k_ρ, k_z). All the information on the right hand side of the second equation are not preserved after summation, without each information of the infinite terms on the right hand side of the second equation in Fig. 21A, how can one perform the right hand side of the third second equation in Fig. 21A to recall a Fourier series?

Question (2)

As shown in Fig. 21B and pages 15-16, the Association requires computation according to the equation in page 16. In the equation, the Fourier transform of a delayed Gaussian filter are used to multiply each FS specified by parameter s. As discussed above with regard to recalling a FS, all the information related to each FS indexed with s and to FC indexed with m are not preserved after summation, without each information of the infinite terms specified with indexes s and m, how can one perform calculation according to the equation in page 16? The same question also applied to the process of applying Gaussian filter to an input string shown in Fig. 21B.

Question (3)

The probability expectation value is calculated based on the equation in line 7, of page 14 and in Fig. 21B. Values of the amplitude of spectral similarity, β_s^2 and frequency difference angle, ϕ_s, are need for the equation. As Explained above, after the formation of Fourier series, the parameters N_{m1}, ρ_{0m1}, N_{m2}, ρ_{0m2} are not preserved. How are the parameters N_{m1}, ρ_{0m1}, N_{m2}, ρ_{0m2} recovered in steps 34 and/or 36 of Fig. 2 so they can be used in last equation of page 14 to calculate the amplitude of spectral similarity, β_s^2, and in the first equation in page 15 to calculate frequency difference angle, ϕ_s, between at least two filtered or unfiltered FSs, or a FS and a string?

c. Therefore, the one skilled in the art cannot follow any of the embodiments to achieve the goal of the proposed invention.

Claim Rejections - 35 USC § 101

(non-operative)

3. Claims 51-322 are rejected under 35 U.S.C. 101 because they are non-operational and do not have utility.

The embodiment of the application is disclosed in Figs. 1-2. It comprises an input layer, an association layer, a string ordering layer, a predominant configuration layer, and a memory. All Claims 51-322 are supported by these five elements. When any one of the above elements is not operative, it does not have any utility.

In the specification, the Applicant correctly pointed out that the following equation in page 40 describes how a time function can be delayed by multiplying a factor $e^{-j2\pi f}o$ to each corresponding component $e^{j2\pi f}$ in Fourier space

	$x(t)=\int_{-\infty}^{\infty}X(f)e^{j2\pi ft}df$		$X(t)=\int_{-\infty}^{\infty}x(t)e^{-j2\pi ft}dt$	(37.109)
Delay	$\delta(t-t_0)$	$\Leftrightarrow$	$e^{-j2\pi ft_0}$	

---- (1)

This is a key step in storing different Fourier components or series in different memories with defined delay information that is later used to recall the stored series or strings for comparison and association. As shown in the above equation that there is an important attribute for this process to work: the multiplying a factor $e^{-j2\pi f}o$ shall have the exact same frequency f such as that of $e^{j2\pi f}$. Please note here that frequency f and its negative counterpart -f are

considered as two different frequencies. The Applicant also teaches in page 8 a Fourier series as shown below with k_ρ and k_z as two parameters of Fourier space.

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho 0}}N_{m_{z0}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_m}}\right)\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{z_{0_m}}\right)\frac{N_{m_{z0}}z_{0_m}}{2}\right)$$

--- (2)

The Applicant considered k_ρ as one of the frequency and expressed its delayed correspondence in page 11 as shown below with the exponential factor in front of the first "sin".

$$\sum_{m=1}^{M}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_m}N_{m_{\rho 0}}N_{m_{z0}}e^{-jk_\rho(\rho_{p_m}+\rho_{i_m})}\sin\left(k_\rho\frac{N_{m_{\rho 0}}\rho_{0_m}}{2}-n\frac{2\pi N_{m_{\rho 0}}}{2}\right)\sin\left(k_z\frac{N_{m_{z0}}z_{0_m}}{2}-n\frac{2\pi N_{m_{z0}}}{2}\right)$$

--- (3)

Equation (3) cannot produce the needed delay, because the following reasons.

-- It is well known that $\sin(fx) = (e^{jfx} + e^{-jfx})/(2j)$. So the first sine function in equation (3) above has two frequencies, a pair of positive and negative f. However, the exponential factor in front of the first "sin" corresponds only to one f, the positive frequency f.

-- Furthermore its multiplication factor for the proposed process for generating delay does not have the exact same frequency f. Their frequencies are listed in the table below. The first sine function in equation (3) has a frequency depending on the data parameters, which are associated with the measured information that can vary from measurement to measurement. They are not related to time. As expressed in page 11, the exponential factor in front of the first "sin" is related to time through time delays.

function	frequency
$\sin\left(k_\rho \frac{N_{m_{\rho 0}} \rho_{0_m}}{2} - n\frac{2\pi N_{m_{\rho 0}}}{2}\right)$	$\pm \quad k_\rho \frac{N_{m_{\rho 0}} \rho_{0_m}}{2}$
$e^{-jk_\rho\left(\rho_{\rho_m} + \rho_{i_m}\right)}$	k_ρ

Now it is evidently that the equation appearing in page 11 of the present specification cannot generate any delayed form of its corresponding function of that shown in page 8. Therefore, the recall of data will be correlated to its corresponding input data. Data can be stored in a memory. However, the stored data cannot be meaningfully recalled. As a consequence, meaningful comparison, recognition, and association cannot be achieved. It results no utility of the presently claimed invention because recognition and association are not operative.

(10) Response to Argument

1. Overview

This application is directed to a method and system for pattern recognition and processing involving processing information in Fourier space. The system is explained in page 7 of the specification:

"As illustrated in Figure 1 , the system 10 includes several function specific layers. These include an Input Layer 12, an Association Layer 14, a String Ordering Layer 16 and a Predominant Configuration Layer 18. The Input Layer 12 receives the data within the input

context and transforms the data into the Fourier series in Fourier space, as defined explicitly in pages 63-64 of the present Brief, representative of the information. The system 10 also includes a memory 20 for storing information. The Input Layer 12 also encodes the input context as delays in time corresponding to a modulation factor of the Fourier series at corresponding frequencies. The Association Layer 14 receives a plurality of Fourier series in Fourier space, including at least one ordered Fourier series from the memory 20, forms a string comprising a sum of the Fourier Series and stores the string to the memory 20. The String Ordering Layer 16 receives the string from the memory 20, orders the Fourier series contained in the string to form an ordered string and stores the ordered string in the memory 20. The Predominant Configuration Layer 18 receives multiple ordered strings from the memory 20, forms associations between the ordered strings to form a complex ordered string, also referred to as a predominant configuration string, and stores the predominant configuration string to the memory 20. The memory 20 may be partitioned in several distinct sections for storing different types of information or distinctly classified types of information."

The method is summarized recited in Claim 51 as produced below:

51. (Previously Presented) A method for recognizing a pattern in information comprising data, the method comprising:

inputting data;

encoding data as parameters of a plurality of Fourier components in Fourier space;

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

determining a spectral similarity between said modulated Fourier series and another Fourier series;

determining a probability expectation value based on said spectral similarity;

generating a probability operand based on said probability expectation value;

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value; and outputting a recognized pattern.

As explained below, **the Appellant did not teach how one can perform sampling and modulating of an added Fourier series, because the sampling and modulating require data parameters $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} and the added Fourier series are functions of only k_ρ and k_z, and carry no information of data parameters $N_{m\rho 0}$, N_{mz0}, ρ_0, z_0 after the encoding and adding step.** Furthermore, the **Appellant's formulation of sampling and modulating do not result a delay function. Because the delay is need for recognizing patterns. The method is not functional for the targeted utility of the invention presented in the present application.**

For a logical presentation, the Examiner will discuss his responses in the following order:

-- With regard to the rejection of claims 51-322 under 35 U.S.C. § 112, First Paragraph,

-- With regard to the rejection of Claims 51-322 under 35 U.S.C. 101 because they are non-operational and do not have utility,

-- With regard to the rejection of claims 307-322 under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter.

2. With regard to the rejection of claims 51-322 under 35 U.S.C. § 112, First Paragraph

a. With regard to section a in page 4 of the Office Action mailed 12/21/2006

In page 4 of the Office Action mailed 12/21/2006, the Examiner pointed out no adequate description is given in the passage in lines 18-25 of page 11 that "the characteristic modulation is encoded as a delay in time by storing the Fourier series in a specific portion of the Input layer section of the memory wherein the specific portion has n+1 sub time intervals." What specific function is used? And how the encoding is performed?

Appellant's argument --

In pages 40-43 of the present Brief, the Appellant cited many portions of the specification for answering the questions. Specifically, the Appellant stated, "Thus, it is apparent to one skilled in the art that the encoding can be provided by a specific modulation frequency tag of the Fourier series, which corresponds to a specific time delay that is recorded in the appropriately designated section of memory having "n+l sub time intervals".

Examiner's response --

A specific **modulation frequency tag was never mentioned in the original specification.** There was no relationship given between a specific modulation frequency tag and a specific time delay. The passage in lines 18-25 of page 11 clearly shows that no frequency tag was provided. When the characteristic modulation is **encoded as a delay in time**, it means that the time delay can be decoded to retrieve the frequency information. This is also shown in passages related equation (37.109) in page 40 of the specification. Therefore, if a specific time delay can be used for decoding frequency information, one skilled in the art do not need a specific modulation frequency tag because it is redundant and wastes memory space and process resource.

As shown in Fig. 3 of the specification, the frequency information is key for data structure (arrange) for manipulating and retrieval of data. Without knowing how to implement this step, the specification cannot enable one to use the method.

b. With regard to section b in page 4 of the Office Action mailed 12/21/2006

Appellant's argument --

For this aspect, the Examiner has it completely wrong. While the layers may function independently of each other, the preferred embodiment comprises their use in concert. For example, it is possible to perform associations in the Association Layer without its activation controlled by the Predominant Configuration Layer, and Strings can be ordered independently in the String Ordering Layer independent of both. The Appellant further stated that, "In fact, an embodiment of Appellant's invention has been through exhaustive peer review and is published in the artificial intelligence literature, a higher standard than required by the U.S. Patent and Trademark Office. Thus, the PhD referees and the Journal have agreed that Appellant's invention teaches a novel, operative development in this field. See R. L. Mills, "Novel Method and System for Pattern Recognition and Processing Using Data Encoded as Fourier Series in Fourier Space", Engineering Applications of Artificial Intelligence, Vol. 19, (2006), pp. 219-234."

Examiner's response --

The Examiner disagreed with the conclusion. Fig. 1 of the present application shows the high level (most basic) structure of the invention. In page 1, the Appellant stated that the invention is directed to a method and system for pattern recognition. How can one, who has a problem of implementing any of an input layer, an association layer, a string ordering layer, a

predominant configuration layer, and a memory, implement the proposed method which is used to support any of Claims 51-322 to achieve the utility of pattern recognition?

With regard to the above article in Engineering Applications of Artificial Intelligence, it does not support that the system can be really implemented in a practical world, because it may represent an abstract idea. An abstract idea is publishable, but not necessary patentable. The issues between the practical implementation and abstract idea are just those asked by the Examiner in the previous office action.

c. With regard to section b in pages 4-7 of the Office Action mailed 12/21/2006

Appellant's argument --

To respond to the issue, the Appellant referred to many parts of the specification as indicated in pages 46-47 to provide support of his teaching.

Examiner's response --

The **Appellant did not answer directly the specific question** related to the Examiner's conclusion: "After summation of FSs to form $V_{\sum s,m}(k_\rho, k_z)$, $V_{\sum s,m}(k_\rho, k_z)$ does not explicitly carry the index information of each FS, s, nor element m. As a consequence, no mathematical operation can be applied to each individual FC or each individual FS after a string is formed." Let us consider the equation shown in page 47 of the present Brief. The result of the summation is $V(k_\rho, k_z)$. Please note that $V(k_\rho, k_z)$ is a function k_ρ *and* k_z with possible being indexed by M.

For example, consider a measurement in which 3 (M=3) transducer elements are used to generate input data. For a first case, all the original data parameters $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} are zero for all m=1, 2, and 3, where m is used to label data of transducer element m. So the summation

of the equation $V(k_\rho, k_z) = 0$ for all (k_ρ, k_z). Similarly, $V_{\sum m}(k_\rho, k_z) = 0$. They are both functions of only k_ρ *and* k_z. Take another case, the original data parameters $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} are zero for all m=1 and 2 and are 1 for m=3. Then $V_{\sum m}(k_\rho, k_z)$ will have the form as:

$$V_{\sum_m}(k_\rho, k_z) = \sum_{n=-\infty}^{\infty} \frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} q_{03} \sin((k_\rho - n2\pi)) \sin((k_z - n2\pi))$$

Clearly, $V_{\sum m}(k_\rho, k_z)$ has no information of $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} in the above equation.

Claim 51 recites a limitation of "modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series". The Appellant provided an exemplary string with a characteristic modulation having a frequency within the band, related to this limitation, in page 15 of the specification. As discussed above, the sampled Fourier series is a function of only k_ρ *and* k_z. , it does not keep record of data parameters $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m}. As shown in the equation in page 15, the exponential terms are related to the modulating function. They are related to information about data parameters $N_{m\rho 0}$, N_{mz0}, ρ_0, z_0, because the exponential term is indexed with m. **As explained above, after summation of FSs to form $V_{\sum s,m}(k_\rho, k_z)$, $V_{\sum m}(k_\rho, k_z)$ or $V(k_\rho, k_z)$, the sampled Fourier series does not carry the index information of element m. How can one apply the modulating of the equation in page 15 of the specification?** The Examiner never questions how equation in page 15 of the specification can be carried out when all data parameters $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} are still known. **The Examiner questioned how the equation can be carried out on the sampled Fourier series without indexed to m, and**

without $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} to carry out the subsequent sampling and modulating process for producing subsequent strings because the series has lost the needed information for computation.

With regard to questions (1)-(3) in pages 6-7 of the previous office action, Appellant again did not answer the question. As Explained above, after the formation of Fourier series, the parameters N_{m1}, ρ_{0m1}, N_{m2}, ρ_{0m2} are not preserved. How can one perform any calculation based on the parameters N_{m1}, ρ_{0m1}, N_{m2}, ρ_{0m2} ? For example, all the information on the right hand side of the second equation in Fig. 21A is not preserved after summation. Without the information of the infinite terms on the right hand side of the second equation in Fig. 21A available, how can one perform the right hand side of the third second equation in Fig. 21A to recall a Fourier series? How can one perform the Association computation according to the equation in page 16? And How can one calculate the probability expectation value based on the equation in line 7, of page 14 and in Fig. 21B?

3. With regard to the rejection of Claims 51-322 under 35 U.S.C. 101 because they are non-operational and do not have utility

Appellant's argument --

In page 9 of the previous office action, the Examiner concluded that Equation (3) of the present specification cannot produce the needed delay. Therefore, it makes the invention non-operational. To respond to the conclusion, the Appellant discussed in pages 53-61 of the Brief how the delay can be produced. (1) Appellant submits that the Examiner is confused on several points. There is no multiplication by a factor $e^{j2\pi f}$ in Eqs. (2) and (3). This is simply a constant

complex number. (2) Furthermore, Appellant respectfully submits that the Examiner is confused about the range of f since it is not two exact frequencies -f0 and f0. Rather, it is a free running variable in Fourier space. Similarly, kp and kz are free running variables in Fourier space. The data parameters modify these variables in the modulation factor and in the Fourier-term.

Examiner's response --

How one delay a signal X(t) with multiplying each Fourier with phase factors is explained below. First let us Fourier transform X(t) as shown in equation (a) below;

$$X(t) = \int a(f)\, e^{j2\pi ft}\, df \qquad (a)$$

X(t) can be delayed by amount T with multiplying each Fourier component $e^{j2\pi ft}$ in Eq. (a) with $e^{-j2\pi fT}$ as below.

$$X'(t) = \int a(f)\, e^{j2\pi ft}\, e^{-j2\pi fT}\, df = \int a(f)\, e^{j2\pi f(t-T)}\, df \qquad (b)$$

If we rewrite t' = t-T, then

$$t = t'+T \qquad (c)$$

Substituting Eq. (c) into Eq.(b), we get

$$X'(t'+T) = \int a(f)\, e^{j2\pi ft'}\, df \qquad (d)$$

The right hand sides of Eqs. (a) and (d) are of the same form. It indicates that X(t) has the same value as X'(t'+T), namely X(0) = X'(T), and X(1) = X'(1+T). X' is a delayed version of X. The key point for the delaying with time T to work is for each frequency f to multiply $e^{j2\pi ft}$ with an exponential term with a phase factor given by $2\pi fT$ such as $e^{-j2\pi fT}$. **That means that phase factor is proportional to the frequency f as fT.**

With regard to point (1) about, the k_ρ used in the exponential term in Eq. (3) is not a constant. It varies with k_ρ which is a frequency in the Fourier space defined by the Appellant.

(See the definition below the equation in page 8 of the present specification.) It is well known that sin (ft) = $(e^{jft} + e^{-jft})/(2j)$. So the first sine function in equation (3) above has two frequencies, a pair of positive and negative f. To make a delay by phase shifting in any Fourier space, no matter a traditional or the special one given by the Appellant, when e^{jft} is multiplied by e^{jfT}, the term associated with e^{-jft} is multiplied by e^{-jfT}. However, the exponential factor in front of the first "sin" corresponds only to one f, the positive frequency f. The Appellant admitted that he did not have the equation and arguing that the f0 is a free running variable. It does matter, the frequency is free running variable not. **The key is that they need to be multiplied simultaneous as a pair with opposite phase delay.**

In the previous office action, the Examiner concluded that

"Furthermore its multiplication factor for the proposed process for generating delay does not have the exact same frequency f. Their frequencies are listed in the table below. The first sine function in equation (3) has a frequency depending on the data parameters, which are associated with the measured information that can vary from measurement to measurement."

The Appellant did not respond to this conclusion. As pointed about, to delay a waveform, the frequencies of each of Fourier series associated with its corresponding coefficient cannot be changed in multiplying the phase factor $e^{-j2\pi fT}$. In the Appellant's special Fourier series in Fourier space shown in page 63 of the Brief, the frequency k_ρ is changed with parameters $N_{m\rho 0}$, N_{mz0}, ρ_0, z_0. As a consequence, the Appellant's teaching cannot produce the needed delay for implementing the method. More specifically, take the equation in page 15 of the specification for consideration. The first sin term has a frequency of $k_\rho (N_{s,m\rho 0}\, \rho_{s,m})/2$. For this term the phase factor is given in the exponential term having a frequency k_ρ. As taught in the specification, the

frequency of k_ρ ($N_{s,m\rho 0}$ $\rho_{s,m}$)/2 changes with measured parameters. The delay depends not only on the transducer elements, but also depends on the measured data. For the first case discussed above in which all the original data parameters $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} are zero for all m=1, 2, and 3, the frequency of k_ρ ($N_{s,m\rho 0}$ $\rho_{s,m}$)/2 is zero for all m=1,3. For the second case discussed above in which the original data parameters $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, z_{0m} are zero for all m=1 and 2 and are 1 for m=3, the frequency of k_ρ ($N_{s,m\rho 0}$ $\rho_{s,m}$)/2 is zero for all m=1 and 2, but is k_ρ/2 for m=3. Data of the same element m=3 is delayed differently and the corresponding memory address for m=3 cannot be correctly defined. The data retrieval will be just random and not meaningful.

Claims 51-322 are thus non-operational and do not have any utility.

4. With regard to the rejection of claims 307-322 under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter

Appellant's argument --

For Claims 307-322, the Examiner fails to discuss how he considers the claims to be data structures, per se, in view of the specific claim limitations cited by the Appeals Board in its May 22, 2005 Decision. Contrary to his conclusory remarks provided in the previous office action, the Examiner further errs in failing to appreciate that the data are functional. The transduced data objects are processed to form a representation of the information contained in the data from a detector in the form of a Fourier series in Fourier space. The data is used as parameters that are input to the system and means to process and achieve pattern recognition and processing.

Examiner's response --

a. With regard to Claims 307-322

As discussed above, the data are stored as the Appellant termed as data structure. They are just collection of data or calculation results stored in a memory. For the data structure to be statutory subject matter, it needs to support specific data manipulation function. As explained above, the usage of the stored data as suggested by the Appellant does not have an operational function for providing utility. Therefore, it does not support manipulation function that is alleged to provide the utility. The data structure as a collection of data values thus is only Non-functional descriptive material.

b. With regard to Claim 313-314, 316-322

Please note that the Examiner did not reject the claims as data structure per se as alleged by the Appellant. The Examiner clearly indicated that the claims recite a data structure in a memory. However, the recited features in the claim body do not constitute a functional description material. So the key question is that whether the claimed subject matter is nonfunctional or not.

Claim 313 is reproduced below.

313. (Previously Presented) A data structure in a memory for access by a computer program for efficient recognition of a pattern in information comprising data stored in the memory, the data structure comprising:
a plurality of transduced data objects, each of said plurality of transduced data objects providing an input data object representative of characteristics received from a respective one of a plurality of transducers acting on a signal provided by characteristics encoded as a Fourier series in Fourier space, wherein said input data objects allows associations among and relational pattern of said input data objects by spectral analysis to achieve recognition of a pattern in information, while preserving input context of said input signal including

an identity of said respective one of said plurality of transducers.

Claim 313 basically recites a data structure in a memory for an application, the data structure comprising a plurality of transduced data objects. The recitation of the following in the body of the claim is an intended-use limitation and contributes no weight in defining the claimed scope:

"each of said plurality of transduced data objects providing an input data object representative of characteristics received from a respective one of a plurality of transducers acting on a signal provided by characteristics encoded as a Fourier series in Fourier space, wherein said input data objects allows associations among and relational pattern of said input data objects by spectral analysis to achieve recognition of a pattern in information, while preserving input context of said input signal including an identity of said respective one of said plurality of transducers."

For example, a camera consisting of a plurality of pixel sensing element is used to capture an image. Each sensing element of the camera is a transducer for transferring light into electronic signal. The electronic signal is then stored in a memory as transduced data objects. The data objects can be inputted in a processor for various images processing including the intended use of association with spectral analysis. Because Claim 313 basically recites a data structure in a memory, the data structure comprising a plurality of transduced data objects for some intended use, the picture data taken by a camera and stored in a memory meet the recited requirement. It is well known in the art that picture data stored in a memory are just non-functional information. For example, a picture has only non-functional information. A plurality

of transduced data objects outputted from a camera does not have physical or logical relationship to support specific data manipulation function, because pictures taken by a camera change from picture to picture according to scene change and thus do not have any well-defined relationship among pixels in an image. A machine or processor can process the image to output useful information. However, the functionality is provided by the machine or processor, not by the compilation of data which is termed as data structure here.

In page 39 of the present Appeal Brief, the Appellant correctly admitted that raw data without formatting and organization and without subsequent processing as taught by Appellant has no utility to achieve pattern recognition or processing. *Claim 313 as recited includes at least a species of only raw image data stored in a memory. Claim 313 as recited includes at least a species of non-functional data stored in a memory. Therefore, although a data structure in a memory is not data per se because of the existence of the memory, it just contains non-functional material stored in a memory which is non-statutory.*

For Claim 314 and 316-322, without a plurality of order formatted data objects, the functionality of the data structure cannot be realized.

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer are provided herein.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Wenpeng Chen

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Conferees:

Matt Bella

Brian Werner

MATTHEW C. BELLA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

BRIAN WERNER
SUPERVISORY PATENT EXAMINER